measured through invasive procedures such as polarimetry, Raman spectroscopy and photoacoustic spectroscopy, scientists have so far been unsuccessful in realizing a reliable non-invasive alternative monitoring technique. Markus Sigrist and colleagues in Switzerland have now developed a mid-infrared photoacoustic technique that can be used to track glucose by analysing deep epidermal layers in the skin. Their set-up comprises an external-cavity quantum cascade laser (tuning range of 1,010–1,095 cm^{-1}) and a 78 mm^3 photoacoustic cell for detection. They controlled the glucose levels of epidermal skin samples housed in the photoacoustic cell by introducing aqueous glucose solutions of different concentrations in the range of 1–100 g l^{-1}. The detection limit of this technique is around 1 g l^{-1}, which, although within the physiological range of 0.3–5 g l^{-1}, is still too high for the *in vivo* glucose monitoring of diabetes patients. The researchers say that a lower detection limit could be achieved by placing the sensor directly on human skin, which would provide a rigid seal for the photoacoustic cell. *JB*

SPECTROSCOPY

Near-field effects

Nano Lett. **12,** 1475–1481 (2012)

Experimentally investigating the characteristics of thermal electromagnetic radiation in the near-field is challenging because of its short-range evanescent character. Now, Andrew Jones and Markus Raschke from JILA and the University of Colorado Boulder in the USA have demonstrated that this task can be achieved by combining scattering scanning near-field optical microscopy with Fourier-transform spectroscopy. They used a heated atomic force microscope tip as both a local thermal source and a scattering probe, and employed a Michelson-type interferometer to perform spectral analysis in the mid-infrared. They observed an enhanced spectral energy density in the near-field associated with phonon, phonon–polariton and vibrational resonances. The researchers told *Nature Photonics* that the findings may have wide implications, ranging from chemical vibrational nano-imaging without the need for an external light source, to a better understanding of nanoscale heat transport and the origin of the Casimir force. *RW*

QUANTUM OPTICS

Multimode frequency combs

Phys. Rev. Lett. **108,** 083601 (2012)

Optical frequency combs, perfect tools for studies in the field of high-precision metrology, could now benefit tasks such as quantum computation. Oliver Pinel and co-workers from France, China and Germany now claim to have realized a multimode non-classical frequency comb with a singly resonant synchronously pumped optical parametric oscillator (SPOPO). They sent 120 fs pulses from a Ti:sapphire mode-locked laser and its second harmonic (wavelength of 397 nm) into a cavity, whose length was locked using the Pound–Drever–Hall technique. They confirmed the non-classicality of the generated field by measuring a noise intensity below the standard quantum limit, and revealed the multimode nature of the comb by studying the distribution of quantum intensity fluctuations in the frequency comb over its optical spectrum. In particular, they conclude that two of the modes of the SPOPO are in a squeezed (quantum-enhanced) state with a normalized intensity noise of <1. *NH*

INTERFEROMETRY

Overcoming Coriolis

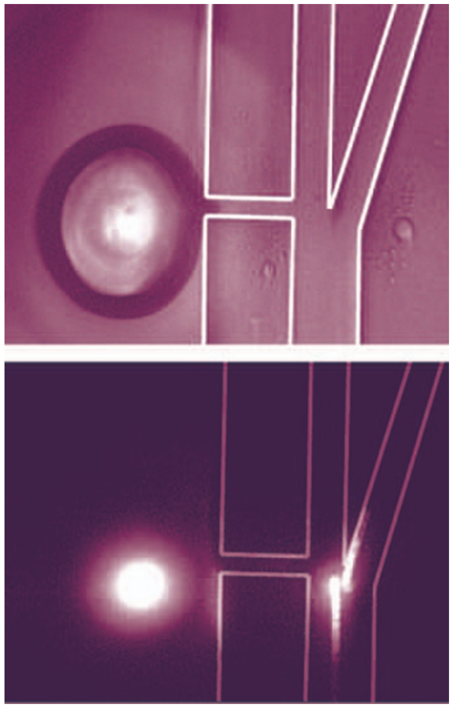
Phys. Rev. Lett. **108,** 090402 (2012)

It is well-known that the performance of large or very sensitive interferometers can be affected by the rotation of the Earth. Indeed, this dependence is put to good use by laser ring gyroscopes, which can detect and measure the Earth's rotation through the Sagnac effect. Now, Shau-Yu Lan and colleagues from the University of California, Berkeley, Lawrence Berkeley National Laboratory and the University of Vienna have significantly improved the contrast of their large space–time atom interferometer by compensating for the Coriolis effect associated with the Earth's motion. In their experiment, laser beams are generated from a 6 W Ti:sapphire laser using acousto-optic modulators for frequency tuning. The Doppler effect is used to select a single pair of counter-propagating frequencies that are resonant with atoms launched ballistically from a 1.5-m-tall fountain of caesium atoms. A retroflection mirror mounted flexibly on top of the vacuum chamber is calibrated by a tilt sensor and moved by piezoelectric actuators to compensate for the Earth's rotation. This Coriolis-corrected interferometer could be used to measure gravity at improved accuracies; the authors predict that the uncertainty in gravitational measurements could be reduced from $6 \times 10^{-8}g$ to around $1 \times 10^{-9}g$. *DP*

MICROFLUIDICS

High-speed cell sorter

Lab Chip **12,** 1378–1383 (2012)



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One of the major applications of flow cytometry is separating cells according to subtype for further biological studies. Current cell-sorting techniques are limited in their purity and throughput, and the ability to sort mixed populations of live cells has yet to be demonstrated. Pei-Yu Chiou and co-workers in the USA have now developed a high-speed, high-purity laser-triggered fluorescence-activated cell sorter. Their device is capable of sorting up to 20,000 mammalian cells per second with a purity of 37%, or 1,500 cells per second with a purity of more than 90%. The device achieves fast switching (30 μs) in a small volume (around 90 pl) by using 532 nm focused pulses from a *Q*-switched Nd:YVO_4 laser to produce vapour bubbles in a microfluidic circuit made from PDMS. The laser-induced bubbles create a liquid jet that temporarily switches the flow of cells from the main channel to a second (collection) channel. The volume and location of the fluid flow can be precisely controlled by the laser pulse energy and focus position, thus allowing multiple cell types to be sorted in any biological liquid. The researchers say that shorter switching times should be possible by utilizing smaller bubbles and a modified channel design. *JB*

Written by James Baxter, Oliver Graydon, Noriaki Horiuchi, David Pile and Rachel Won.